

that constantly preheats the pressurized air. The air preheating chamber possesses a series of heat conduction rods that dissipate excess heat from the air preheater element to the external surface of the preheater block. The preheated oil is mixed with the preheated air and atomized through one or more nozzle assemblies as the mixture is expelled through the nozzle. The atomized oil forms a highly flammable mist that is ignited as it passes in proximity to one or more ignition devices. The atomized fuel, igniters and resulting flame are enveloped by a unique flame retention head designed to promote complete fuel combustion and produce a flame that is spherical in shape and emits an even distribution of heat.

## **CLAIMS.**

I claim:

1. An apparatus for the combustion of liquid fuels, including high-viscosity and waste oils, comprising:
  - a. A pressurized fuel delivery mechanism;
  - c. One or more oil preheaters located within one or more preheater blocks into which pressurized fuel for combustion flows from an outside source past one or more heating elements which do not produce heat until the burner calls for heat;
  - d. One or more oil pressure gauges through which pressurized fuel for combustion flows before entering said oil preheater;

- e. One or more oil regulators through which pressurized fuel for combustion flows before entering said oil preheater;
- f. One or more normally closed oil solenoids or valves that are opened when the burner calls for heat through which pressurized fuel for combustion flows before entering said oil preheater;
- g. One or more cumulative air tanks that accept pressurized air from an outside source and gradually feeds the pressurized air into one or more air preheaters located within one or more of the preheater blocks.
- h. One or more cumulative air tanks that accept air from an outside source through one or more normally closed air solenoids or valves that are opened when the burner calls for heat;
- i. One or more cumulative air tanks that accept air from an outside source through one or more normally closed air solenoids or valves that are opened when the burner calls for heat and are energized when the burner cycles off such that residual air pressure in the cumulative air tank blows out any residual oil left in the nozzle assembly, thereby minimizing unintended post-flame oil discharge from the nozzle;
- j. One or more adjustable air regulators through which the compressed air from an outside source can be regulated and adjusted as it enters the one or more cumulative air tanks;
- k. One or more air pressure gauges between the one or more cumulative air tanks and the air preheater.

1. One or more air preheaters into which pressurized air for combustion flows past one or more air heating elements, at least one of which elements is warm at all times and one or more elements which are not heated until the burner calls for heat;
  - m. A series of one or more heat conductive members connecting one or more of the air preheater elements with the external surface of the preheater;
  - n. One or more nozzles through which the preheated, pressurized oil and preheated pressurized air are transported, mixed and atomized into microscopic droplets of aerated oil;
  - o. One or more ignition devices in close proximity to the output end of the one or more atomization nozzles, capable of igniting the atomized fuel as it exits each nozzle;
2. The apparatus as described in claim 1, and/or claim 3, and/or claim 4, and/or claim 5, and/or claim 6, and/or claim 7, wherein one or more conditional activation switches are attached to the one or more air preheater elements such that one or more of the air preheater elements will not produce heat until manually activated.
3. The apparatus as described in claim 1 and/or claim 2, and/or claim 4, and/or claim 5 and/or claim 6 and/or claim 7, wherein one or more conditional activation switches are attached to the one or more oil preheater elements such that one or more of the oil preheater elements will not heat until manually activated.

4. The apparatus as described in claim 1 and/or claim 2 and/or claim 3, and/or claim 5, and/or claim 6, and/or claim 7, wherein a series of one or more nozzles are controlled individually by one or more switches such that the flow of oil to each nozzle can be separately controlled;
5. The apparatus as described in claim 1 and/or claim 2 and/or claim 3, and/or claim 4, and/or claim 6, and/or claim 7, wherein a series of one or more nozzles controlled individually by one or more switches such that the flow of air to each nozzle can be separately controlled;
6. The apparatus as described in claim 1 and/or claim 2 and/or claim 3, and/or claim 4, and/or claim 5 with a cylindrical shaped retention head, enveloping the said nozzles, ignition devices and resulting flame having a plurality of fins at one end angled toward the centerline of said retention head thus introducing additional air for combustion to the atomized oil in a circular motion to promote complete fuel combustion, control flame spread and dissipate heat;
7. The apparatus as described in claim 1 and/or claim 2 and/or claim 3, and/or claim 4, and/or claim 5, and/or claim 6, with a sleeve extending the remote end of the retention head past the plurality of retention head fins, in the direction of the flame to resist the centrifugal force of the circular flow of atomized oil as it is combined with additional air for combustion in order to direct the same toward the source of ignition at the ignition device thus promoting complete combustion of the atomized fuel.